# PATENT ABSTRACTS OF JAPAN

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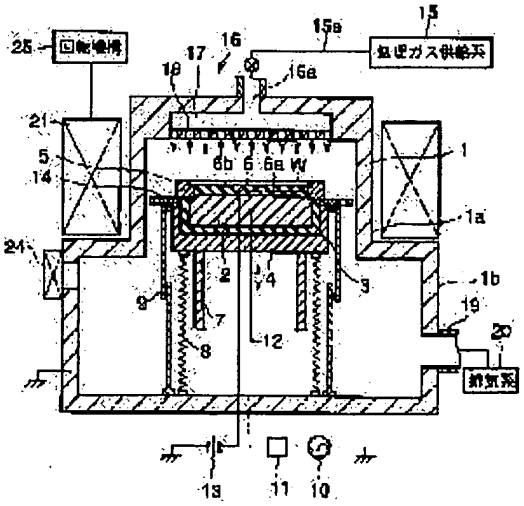
## (54) PLASMA PROCESSING EQUIPMENT AND METHOD FOR PROCESSING THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a plasma processing equipment and a method for plasma processing which have an uniform processing rate without causing a charge up damage on a substrate to be processed.

SOLUTION: The plasma processing equipment has a chamber 1 which can hold a vacuum state, a pair of electrodes 2 and 16 placed in the chamber 1 facing with each other, an electric field forming means 10 which forms a high frequency electric field between electrodes 2 and 16, a processing gas introduction means 15 which supplies a process gas into the chamber 1, and a magnetic field forming means 21 which forms a magnetic field at the periphery of processing space made between electrodes 2 and 16. Under a condition that a substrate W is held on the electrode 2 for processing and the magnetic field is formed at the periphery of the processing space by the magnetic field forming means 21, the high frequency electric field formed between the electrodes 2 and 16 produces plasma of the process gas, which gives the plasma processing to the substrate W.



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CLAIMS

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Claim(s)]
Claim 1] The chamber which can be held to a vacuum, and the electrode of the pair which countered mutually and was prepared in said chamber, The electric-field means forming which forms high frequency electric field between the electrodes of these pairs, and a raw gas supply means to supply raw gas in said chamber, It is prepared in the perimeter of said chamber and the magnetic field means forming which forms a magnetic field in the perimeter of the processing space formed between the electrodes of said pair is provided. Where the processed substrate was supported by one side among said electrodes and a magnetic field is formed in the perimeter of said processing space of said magnetic field means forming Plasma treatment equipment characterized by forming the plasma of raw gas of the RF electric field formed in inter-electrode [ of said pair ], and performing plasma treatment to a processed substrate.
Claim 2] The chamber which can be held to a vacuum, and the 1st and 2nd electrodes prepared so that phase opposite might be carried out into said chamber, A RF impression means to impress a RF to said 2nd electrode and to form electric field between said 1st and 2nd electrodes, It is prepared in a raw gas supply means to supply raw gas in said chamber, and the perimeter of said chamber. Where it provided the magnetic field means forming which forms a magnetic field in the perimeter of the processing space formed between said 1st and 2nd electrodes, and the processed substrate was supported by said 2nd electrode and a magnetic field is formed in the perimeter of said processing space of said magnetic field means forming Plasma treatment equipment characterized by forming the plasma of raw gas of the RF electric field formed in inter-electrode [ said / 1st and 2nd ], and performing plasma treatment to a processed substrate.
Claim 3] Plasma treatment equipment according to claim 2 characterized by providing further the focal conductive or insulating ring prepared in the perimeter of the processed substrate on said 2nd electrode.
Claim 4] Said RF impression means is plasma treatment equipment according to claim 2 or 3 characterized by impressing the high-frequency power whose frequency is 13.56-150MHz.
Claim 5] Said RF impression means is plasma treatment equipment according to claim 2 or 3 characterized by having the 1st RF generator which impresses the RF for plasma formation, and the 2nd RF generator which impresses the RF for on drawing in.
Claim 6] Plasma treatment equipment according to claim 5 characterized by for the frequency of said 1st RF generator being 13.56-150MHz, and the frequency of said 2nd RF generator being 500kHz - 5MHz.
Claim 7] Said magnetic field means forming is plasma treatment equipment given in any 1 term of claim 1 to claim 6 characterized by having the ring magnet of the multipole condition which comes to arrange two or more segment magnets which consist of a permanent magnet around said chamber in the shape of a ring.
Claim 8] Plasma treatment equipment according to claim 7 characterized by providing further a rotation means to rotate said ring magnet along with the circumferencial direction of said chamber.
Claim 9] While arranging the electrode of a pair, making one of electrodes support a processed substrate and forming electric field in a chamber inter-electrode [ of said pair ] The plasma treatment approach characterized by forming the plasma of raw gas by the RF electric field which formed the magnetic field in the perimeter of the processing space formed between the electrodes of said pair, and were formed in inter-electrode [ of said pair ] in the condition, and performing plasma treatment to a processed substrate.

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## DETAILED DESCRIPTION

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Detailed Description of the Invention]
0001]
Field of the Invention] This invention relates to the plasma treatment equipment and the art which perform processing by the plasma to substrates, such as a semi-conductor wafer.
0002]
Description of the Prior Art] In recent years, the magnetron plasma etching system which generates the plasma of high density in a low voltage ambient atmosphere comparatively, and etches micro processing is put in practical use. A permanent magnet is arranged above a chamber, and this equipment impresses the RF electric field which intersect perpendicularly with this, using the drift motion of the electron produced in that case, it is very efficient and etches it while it impresses horizontally the magnetic field revealed from the permanent magnet to a semi-conductor wafer (it is only hereafter described as a wafer).
0003] In such magnetron plasma, although it is a level magnetic field, since the uniform level magnetic field is not necessarily formed with the above-mentioned equipment to the magnetic field perpendicular to electric field, i.e., a wafer, contributing to electronic drift motion has the ununiformity of an etch rate, and the problem that a charge-up damage etc. arises rather than it has the enough homogeneity of the plasma.
0004] In order to avoid such a problem, it is requested that a uniform level magnetic field is formed to a wafer in the processing space in a chamber, and the dipole ring magnet is known as a magnet which can generate such a magnetic field. As shown in drawing 5 , this dipole ring magnet 102 arranges two or more anisotropy segment pillar-shaped magnets 103 on the outside of a chamber 101 in the shape of a ring, shifts the direction of magnetization of the segment pillar-shaped magnet 103 of these plurality on it little by little, and forms the level magnetic field B uniform as a whole in it. In addition, drawing 5 is drawing (top view) which looked at equipment from the top, and N shows the end face side of the direction of a magnetic field, and it shows the location of 90 degrees for the tip side by E and W from S and these. Moreover, in drawing 5 , a reference mark 100 is a wafer.
0005] by the way, in such a dipole ring magnet, although the homogeneity of a magnetic field is markedly alike and good as compared with the conventional magnetic field generator, since the level magnetic field formed with this dipole ring magnet is a level magnetic field it has turned [ magnetic field ] only to the one direction of N to S, an electron performs drift motion, goes to an one direction, and, the way things stand, produces the ununiformity of a plasma consistency. namely, an electron -- the outer product of electric field and a field -- when the direction, i.e., electric field, is formed toward the bottom from the top, in order to perform drift motion and to progress toward W from E, at the E side, a plasma consistency is low and the ununiformity that a plasma consistency is high arises in the W side. And when the ununiformity of such a plasma consistency arises, and a hole is formed of etching, there is a possibility of producing a charge-up damage.
0006] Thus, in the present magnetron plasma etching system, since a charge-up damage arises unescapable, in order to cancel such a charge-up damage completely, a magnet must be removed.
0007]
Problem(s) to be Solved by the Invention] However, although a charge-up damage is canceled by removing a magnet, the phenomenon in which the etching rate in a wafer side becomes large in the center which is the electric supply location of high-frequency power may arise. Such a phenomenon seldom becomes a problem, when the frequency of the high-frequency power to impress is small, but in order to realize efficient etching processing by the high plasma consistency demanded recently, when the frequency of high-frequency power is made high so that it may compensate a fallen part of the plasma consistency by removing a magnet, it is actualized.
0008] This invention is made in view of this situation, and it aims at offering the plasma treatment equipment and the

)lasma treatment approach of making a processing rate homogeneity, without generating a charge-up damage, in case )lasma treatment of the processed substrate is carried out.

0009]

Means for Solving the Problem] In order to solve the above-mentioned technical problem, the chamber which can hold his invention to a vacuum, The electric-field means forming which forms RF electric field between the electrode of the )air which countered mutually and was prepared in said chamber, and the electrode of these pairs, It is prepared in a raw ;as supply means to supply raw gas in said chamber, and the perimeter of said chamber. Where it provided the magnetic ield means forming which forms a magnetic field in the perimeter of the processing space formed between the :lectrodes of said pair, and the processed substrate was supported by one side among said electrodes and a magnetic fiel s formed in the perimeter of said processing space of said magnetic field means forming The plasma of raw gas is ormed of the RF electric field formed in inter-electrode [ of said pair ], and the plasma treatment equipment :haracterized by performing plasma treatment to a processed substrate is offered.

0010] Moreover, the chamber which can hold this invention to a vacuum and the 1st and 2nd electrodes prepared so tha )hase opposite might be carried out into said chamber, A RF impression means to impress a RF to said 2nd electrode an o form electric field between said 1st and 2nd electrodes, It is prepared in a raw gas supply means to supply raw gas in :aid chamber, and the perimeter of said chamber. Where it provided the magnetic field means forming which forms a nagnetic field in the perimeter of the processing space formed between said 1st and 2nd electrodes, and the processed :ubstrate was supported by said 2nd electrode and a magnetic field is formed in the perimeter of said processing space o :aid magnetic field means forming The plasma of raw gas is formed of the RF electric field formed in inter-electrode said / 1st and 2nd ], and the plasma treatment equipment characterized by performing plasma treatment to a processed :ubstrate is offered.

0011] Furthermore, while this invention arranges the electrode of a pair, makes one of electrodes support a processed :ubstrate and forms electric field in a chamber inter-electrode [ of said pair ] The plasma of raw gas is formed by the RF :lectric field which formed the magnetic field in the perimeter of the processing space formed between the electrodes of :aid pair, and were formed in inter-electrode [ of said pair ] in the condition, and the plasma treatment approach :haracterized by performing plasma treatment to a processed substrate is offered.

0012] Since a magnetic field is formed in the perimeter of processing space by magnetic field means forming according o this invention While being able to prevent a charge-up damage as a non-magnetic field condition substantially, a )rocessed substrate's existence location Even when the frequency of the high-frequency power which effectiveness is lemonstrated by this magnetic field in slight plasma closing depth, and is impressed is high The plasma treatment rate in he processed substrate in processing space, for example, an etching rate, can be made almost equivalent in the edge :ection and the center section of a processed substrate, and a processing rate can be equalized.

0013] In order to form a magnetic field in the perimeter of such processing space, the ring magnet of the multipole :ondition which comes to arrange two or more segment magnets which consist of a permanent magnet around said :hamber in the shape of a ring can be used.

0014] Although there is a possibility that the phenomenon in which a chamber wall is shaved in the part corresponding o the magnetic pole may arise when a magnetic field is formed with the ring magnet of such a multipole condition, such in-arranging is cancelable by establishing a rotation means to rotate a ring magnet along with the circumferencial lirection of a chamber.

0015] Moreover, the equalization effectiveness of plasma treatment can be further heightened by preparing a focal :onductive or insulating ring in the perimeter of the processed substrate on an electrode. That is, since even a focal ring ield functions as an electrode in a conductive case, plasma treatment [ in / in a plasma formation field / the periphery of )readth and a processed substrate ] is promoted on a focal ring, and the homogeneity of processing improves. Moreover, :ince a charge cannot be delivered and received between a focal ring, and the electron in the plasma or ion in an nsulating case, the operation which shuts up the plasma can be increased and the homogeneity of processing improves.

0016] This invention is effective, especially when the frequency of high-frequency power is as high as 13.56-150MHz nd it is easy to produce the ununiformity of plasma treatment. Moreover, what has the 1st RF generator which mpresses the RF for plasma formation, and the 2nd RF generator which impresses the RF for ion drawing in as a RF mpression means can be used, and the frequency of 13.56-150MHz and the 2nd RF generator can be set to 500kHz - )MHz for the frequency of the 1st RF generator in that case.

0017]

Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to an ccompanying drawing. Drawing 1 is the sectional view showing the plasma etching system concerning 1 operation :estalt of this invention. This etching system is constituted airtightly and nothing and a wall have the chamber 1 made

rom aluminum for the shape of a cylinder with a stage which consists of up 1a of a minor diameter, and lower 1b of a najor diameter.

0018] In this chamber 1, the support table 2 which supports horizontally the wafer W which is a processed substrate is ormed. The support table 2 consists of aluminum and is supported by the susceptor 4 of a conductor through the electric nsulating plate 3. Moreover, the focal ring 5 formed with the conductive ingredient or the insulating ingredient is formed n the upper periphery of the support table 2. As this focal ring 5, when the diameter of Wafer W is 200mmphi, the thing of the diameter of 240-280mmphi is adopted. Rise and fall of the above-mentioned support table 2 and susceptor 4 are ttained according to the ball-thread device containing a ball thread 7, and the drive part of the lower part of susceptor 4 s covered with the bellows 8 made from stainless steel (SUS). It is grounded, and refrigerant passage (not shown) is repared into the support table 2, and a chamber 1 can be cooled. Moreover, the bellows covering 9 is formed in the utside of bellows 8.

0019] The feeder 12 for [ of the support table 2 ] supplying high-frequency power in the center mostly is connected, and he matching box 11 and RF generator 10 are connected to this feeder 12. the range of 13.56-150MHz from RF generator .0 -- the range of 13.56-67.8MHz, for example, 40MHz high-frequency power, is preferably supplied to the support able 2. On the other hand, the support table 2 is countered, the shower head 16 of each other mentioned later is formed n that upper part in parallel, and this shower head 16 is grounded. therefore, the support table 2 and the shower head 16 these function as an electrode of a pair.

0020] On the front face of the support table 2, the electrostatic chuck 6 for carrying out electrostatic adsorption of the afer W is formed. Between insulator 6b, electrode 6a intervenes, it is constituted and, as for this electrostatic chuck 6, DC power supply 13 are connected to electrode 6a. And by impressing an electrical potential difference to electrode 6a rom a power source 13, the semi-conductor wafer W adsorbs according to Coulomb force.

0021] It is controllable to predetermined temperature in Wafer W by forming in the interior of the support table 2 the efrigerant passage which is not illustrated, and circulating a proper refrigerant in it. Moreover, in order to transmit the old energy from a refrigerant to Wafer W efficiently, the gas installation device (not shown) which supplies helium gas o the rear face of Wafer W is established. Furthermore, the baffle plate 14 is formed in the outside of the focal ring 5. The baffle plate 14 has flowed with the chamber 1 through susceptor 4 and bellows 8.

0022] The above-mentioned shower head 16 is formed so that the ceiling wall part of a chamber 1 may be countered at he support table 2. Many gas discharge openings 18 are formed in the inferior surface of tongue, and the shower head 16 as gas induction 16a in the upper part. And space 17 is formed in the interior. Gas supply piping 15a is connected to gas nduction 16a, and the raw gas supply system 15 which supplies the raw gas which consists of the reactant gas and lilution gas for etching is connected to the other end of this gas supply piping 15a. As reactant gas, the gas of a halogen ystem and the gas usually used [ gas / Ar gas, / helium ] in this field as dilution gas can be used.

0023] Such raw gas reaches [ from the raw gas supply system 15 ] the space 17 of the shower head 16 through gas upply piping 15a and gas induction 16a, and is breathed out from the gas discharge opening 18, and etching of the film ormed in Wafer W is presented with it.

0024] The exhaust air port 19 is formed in the side attachment wall of lower 1b of a chamber 1, and the exhaust air ystem 20 is connected to it in this exhaust air port 19. And the inside of a chamber 1 can be decompressed now to a redetermined degree of vacuum by operating the vacuum pump formed in the exhaust air system 20. On the other hand, he gate valve 24 which opens and closes the carrying-in outlet of Wafer W is formed in the side-attachment-wall bottom of lower 1b of a chamber 1.

0025] On the other hand, around up 1a of a chamber 1, the ring magnet 21 is arranged concentrically, and a field is ormed in the perimeter of the processing space between the support table 2 and the shower head 16. This ring magnet 21 s pivotable by the rolling mechanism 25.

0026] As shown in the horizontal sectional view of drawing 2 , after having been supported by the supporter material hich two or more segment magnets 22 which consist of a permanent magnet do not illustrate, the ring magnet 21 is rranged in the shape of a ring, and is constituted. In this example, 16 segment magnets 22 are arranged in the state of the nultipole in the shape of a ring (concentric circular). Namely, in the ring-like magnet 21, it is formed between the egment magnets 22 with which it is arranged so that the sense of the magnetic pole of two or more segment magnet 22 djoining comrades may turn into reverse sense mutually, therefore line of magnetic force adjoins like illustration, the nagnetic field of 200 - 2000Gauss (0.02-0.2T) is formed only in the periphery of processing space, and a wafer rrangement part will be in a non-magnetic field condition substantially.

0027] Substantially, a non-magnetic field means that the magnetic field which affects a wafer arrangement part at tching processing is not formed, and does not affect wafer processing substantially, for example, the magnetic field elow flux density 10Gauss (1000microT) may exist in the wafer periphery here. In the condition which shows in

lrawing 2 , the magnetic field for example, below flux density 4.2Gauss (420microT) is impressed to the wafer )eriphery, and the function which shuts up the plasma by this is demonstrated.

0028] In addition, the number of segment magnets is not limited to this example. Moreover, that cross-section :onfiguration can also adopt not only a rectangle but configurations of arbitration, such as a circle, a square, and a rapezoid, like this example. Especially the magnet ingredient that constitutes the segment magnet 22 is not limited, :ither, and well-known magnet ingredients, such as a rare earth system magnet, a ferrite system magnet, and an alnico nagnet, can be applied.

0029] Next, the processing actuation in the plasma etching system constituted in this way is explained. First, a gate alve 24 is made open, after Wafer W is carried in in a chamber 1 and laid in the support table 2, the support table 2 goes ıp to the location of illustration, and the inside of a chamber 1 is exhausted through the exhaust air port 19 by the acuum pump of the exhaust air system 20.

0030] After the inside of a chamber 1 becomes a predetermined degree of vacuum, into a chamber 1, 100-1000sccm 0.1 - 1 L/min) installation of the predetermined raw gas is carried out from the raw gas supply system 15, for example. The inside of a chamber 1 a predetermined pressure For example, 10 - 1000mTorr (1.33-133.3Pa), It is held preferably at 20 - 200mTorr (2.67-26.66Pa) extent, and the high-frequency power 13.56-150MHz, for example, 40MHz, and whose )ower a frequency is 100-3000W is supplied to the support table 2 from RF generator 10 in this condition. At this time, a )redetermined electrical potential difference is impressed to electrode 6a of the electrostatic chuck 6 from DC power :upply 13, and Wafer W is adsorbed according to Coulomb force.

0031] In this case, by impressing high-frequency power to the support table 2 which is a lower electrode as mentioned ıbove, RF electric field are formed in the processing space between the shower head 16 which is an up electrode, and the :upport table 2 which is a lower electrode, the raw gas supplied to processing space by this is plasma-ized, and the )redetermined film on Wafer W is etched by that plasma.

0032] Although the magnetic field as shown in the perimeter of processing space at drawing 2 is formed with the ring nagnet 21 of a multipole condition in the case of this etching, since this magnetic field is formed in the perimeter of )rocessing space, a Wafer's W existence location will be in a non-magnetic field condition substantially, and will not )roduce a charge-up damage. And 13.56-67.8MHz, even when high, and even when [ 13.56-150MHz and / desirable ], :ince effectiveness is demonstrated by this magnetic field in slight plasma closing depth and the etching rate of the edge :ection of Wafer W can be made high, the frequency of the RF to impress can make the etching rate of Wafer W almost :quivalent in that edge section and center section, and can equalize an etching rate.

0033] By the way, although there is a possibility that the phenomenon in which the part (for example, part shown by P )f drawing 2 ) corresponding to the magnetic pole of the wall of a chamber 1 is deleted locally may arise when a nagnetic field is formed with the ring magnet of such a multipole condition By rotating the ring magnet 21 along with he circumferencial direction of a chamber 1 by the rolling mechanism 25, it is avoided that a magnetic pole contacts ocally to a chamber wall, and it is prevented that a chamber wall is shaved locally.

0034] Moreover, since the focal conductive or insulating ring 5 is formed in the perimeter of the wafer W on the suppor able 2 which is a lower electrode, the equalization effectiveness of plasma treatment can be heightened further. That is, :ince even a focal ring field functions as a lower electrode when the focal ring 5 is formed with conductive ingredients, :uch as silicon and SiC, plasma treatment [ in / in a plasma formation field / the periphery of breadth and Wafer W ] is )romoted on the focal ring 5, and the homogeneity of an etching rate improves. Moreover, since the focal ring 5 cannot leliver and receive a charge between the focal ring 5, and the electron in the plasma or ion in the case of insulating ngredients, such as a quartz, the operation which shuts up the plasma can be increased and the homogeneity of an :tching rate improves.

0035] It is desirable to make the RF for drawing the RF for plasma production and the ion in the plasma from a iewpoint which makes an etching rate still higher superimpose. RF generator 26 for ion drawing in is connected to a natching box 11 besides RF generator 10 for plasma production, and these are made to specifically superimpose, as :hown in drawing 3 . In this case, as RF generator 26 for ion drawing in, the range whose frequency is 500kHz - 5MHz, 'or example, the thing which is 3.2MHz, is used.

0036] Next, the result compared by the case where it etches by forming a magnetic field in the perimeter of processing :pace with a multipole magnet according to the case where it etches without using a magnet, and this invention is :xplained.

0037] Here, as an RF generator that whose frequency is 40MHz as an RF generator for plasma production, and for ion lrawing in, using that whose frequency is 3.2MHz, total 130sccm (0.13 L/min) was introduced in the chamber by the low rate of C4H8, and O2 and Ar2:1:10 as raw gas, chamber internal pressure was set to 50mTorr(s) (6.67Pa), the )ower supplied from the above-mentioned RF generator was changed, and etching processing was performed. The result

s shown in drawing 4 .
0038] when a magnetic field was formed in the perimeter of processing space using a multipole magnet based on this nvention as are shown in (a) of drawing 4 , and the etching rate of a wafer center section becomes low by the periphery ighly and it shows in (b) to a thing with the bad homogeneity of an etching rate, in not using a magnet, also on ondition that any, the homogeneity of an etching rate was markedly alike and improved.
0039] In addition, this invention can be changed variously, without being limited to the gestalt of the above-mentioned mplementation. For example, although the ring magnet of the multipole condition which comes to arrange around a hamber two or more segment magnets which consist of a permanent magnet as magnetic field means forming in the hape of a ring was used with the above-mentioned operation gestalt, if a magnetic field can be formed in the perimeter f processing space and the plasma can be shut up, it will not be limited to this.
0040] Moreover, although the above-mentioned operation gestalt showed the case where a semi-conductor wafer was sed as a processed substrate, it does not restrict to this. Furthermore, although the gestalt of the above-mentioned mplementation showed the example which applied this invention to the plasma etching system, it is applicable not only o this but other plasma treatment. That is, it can also apply to the plasma-CVD equipment which changed raw gas into ell-known material gases for CVD from the gas for etching, and can also apply to the plasma sputtering system which as arranged the target so that face to face may be stood against a processed object in a chamber.
0041]
Effect of the Invention] Since a magnetic field is formed in the perimeter of processing space by magnetic field means orming according to this invention as explained above A processed substrate's existence location, preventing a charge-p damage as a non-magnetic field condition substantially Even when the frequency of the high-frequency power which an be made to demonstrate effectiveness in slight plasma closing depth by this magnetic field, and is impressed is high The plasma treatment rate in the processed substrate in processing space, for example, an etching rate, can be made lmost equivalent in the edge section and the center section of a processed substrate, and a processing rate can be qualized.
0042] In order to form a magnetic field in the perimeter of such processing space, the ring magnet of the multipole ondition which comes to arrange two or more segment magnets which consist of a permanent magnet around said hamber in the shape of a ring can be used, but when a magnetic field is formed with the ring magnet of such a multipole ondition, there is a possibility that the phenomenon in which a chamber wall is shaved in the part corresponding to the nagnetic pole may arise. On the other hand, such un-arranging is cancelable by establishing a rotation means to rotate a ing magnet along with the circumferencial direction of a chamber.
0043] Moreover, by preparing a focal conductive or insulating ring in the perimeter of the processed substrate on an lectrode, in a conductive case, by promoting the plasma treatment in the periphery of a processed substrate, when the peration which shuts up the plasma increases in an insulating case, the equalization effectiveness of plasma treatment an be heightened further again.

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## )ESCRIPTION OF DRAWINGS

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Brief Description of the Drawings]
Drawing 1] The sectional view showing the plasma etching system concerning 1 operation gestalt of this invention.
Drawing 2] The horizontal sectional view showing typically the ring magnet arranged around the chamber of the :quipment of drawing 1 .
Drawing 3] The outline sectional view showing partially plasma treatment equipment equipped with the RF generator 'or plasma production, and the RF generator for ion drawing in.
Drawing 4] Drawing comparing and showing the homogeneity of an etching rate by the case where it etches by forming ı magnetic field in the perimeter of processing space with a multipole magnet according to the case where it etches ithout using a magnet, and this invention.
Drawing 5] The mimetic diagram showing the conventional equipment using a dipole ring magnet.
Description of Notations]
.; chamber
!; support table (the 2nd electrode)
3; a focal ring
.0 26; RF generator
.5; raw gas supply system
.6; shower head (the 1st electrode)
!0; exhaust air system
!1; ring magnet (magnetic field means forming)
!2; segment magnet
!5; rolling mechanism
; semi-conductor wafer (processed substrate)

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DRAWINGS

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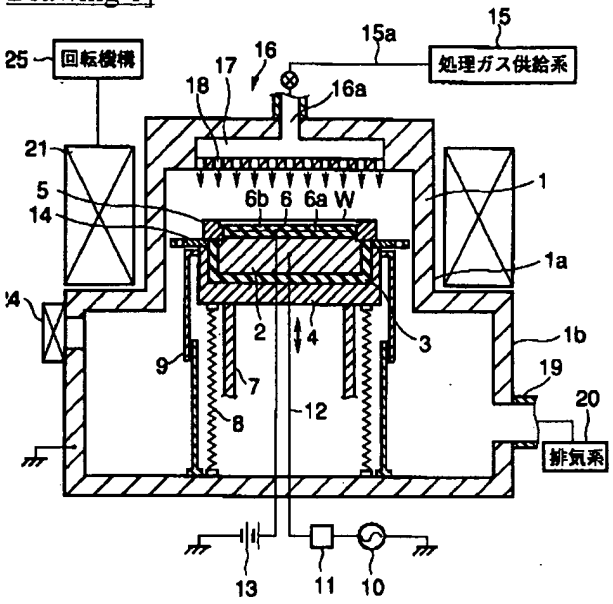
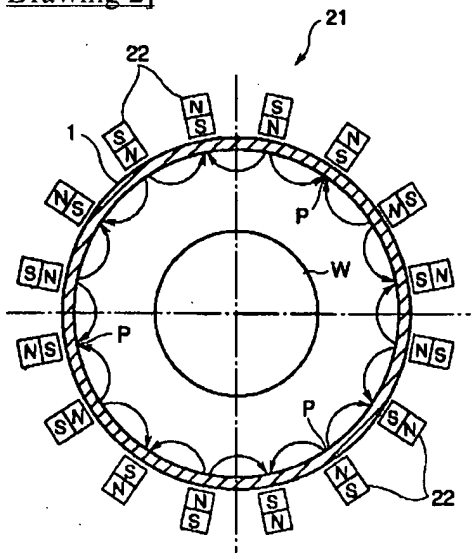
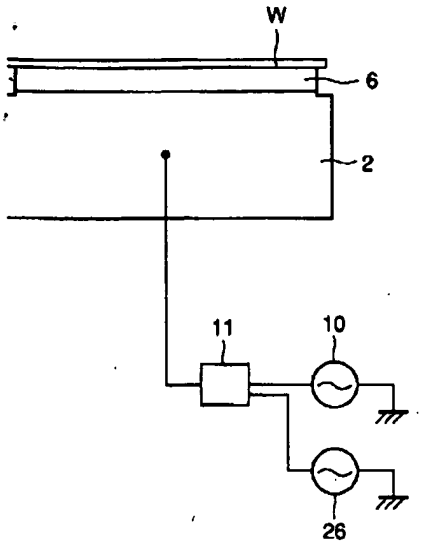
Drawing 1]



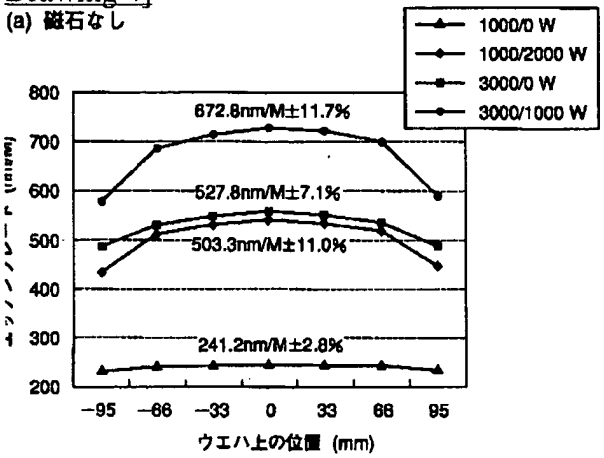

Drawing 2]

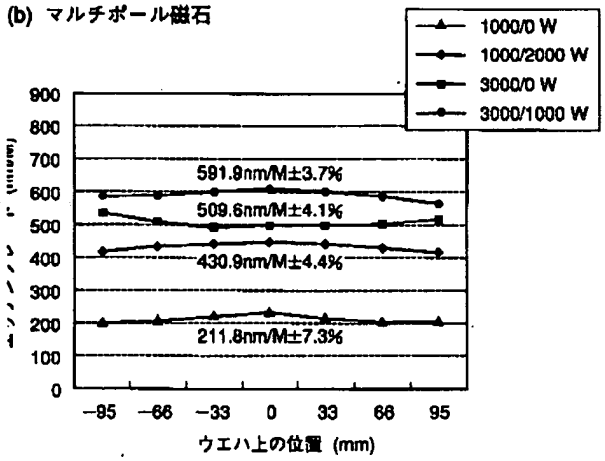



Drawing 3]

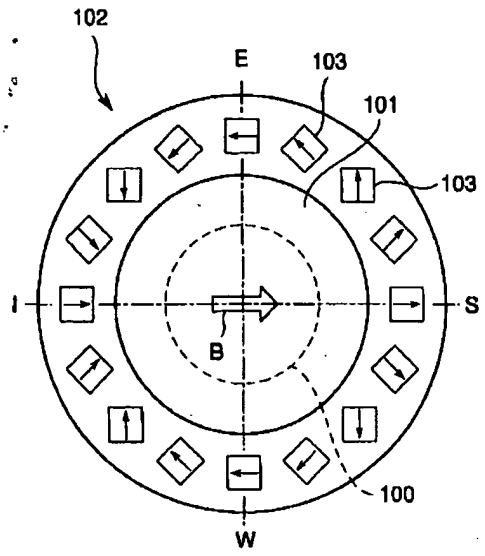



Drawing 4]




Drawing 5]




Translation done.]